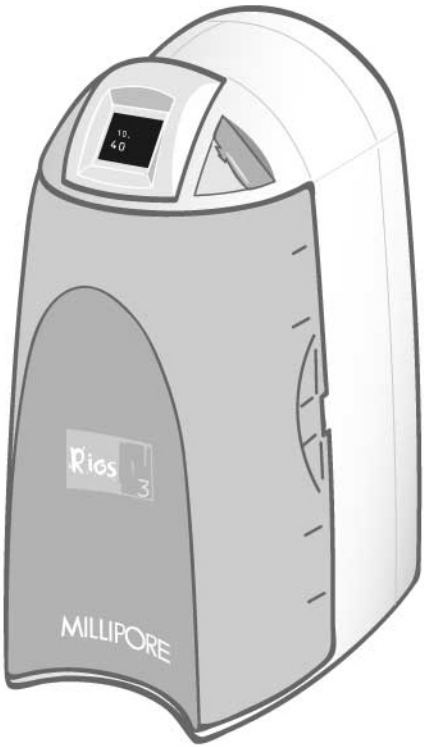
RIOS™ 3

USER MANUAL



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We manufacture and sell water purification systems designed to produce pure or ultrapure water with specific characteristics (µS/cm, T, TOC, CFU/ml, Eu/ml) when it leaves the water purification system provided that the RiOs Systems are fed with water quality within specifications, and properly maintained as required by the supplier.

We do not warrant these systems for any specific applications. It is up to the end user to determine if the quality of the water produced by our systems matches his expectations, fits with norms/legal requirements and to bear responsibility resulting from the usage of the water.

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RiOs

- The RiOs System mentioned above is manufactured in Millipore SAS - 67120 Molsheim - FRANCE - facilities whose quality management system is approved by an accredited registering body to the ISO9001 Quality System Standards.

- We certify that these Lab RiOs Systems are designed and manufactured in application of the following European Council directives:

- 89/336/CEE relating to Electromagnetic compatibility

- 73/23/CEE relating to electrical equipment designed for use within certain voltage limits

- Standards to which conformity is declared as applicable are the following :

  - EN 61326-1: 1997: Electrical equipment for measurement, control and laboratory use – EMC requirements.
  - EN 61010-1: 2001: Safety requirements for electrical equipment for measurement, control, and laboratory use.

Guy REYMANN

Quality Assurance Manager

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Chapter 1 INTRODUCTION

1-1 USING THIS MANUAL

This User Manual is a guide for use during the installation, normal operation and maintenance of a RiOs 3 Water Purification System. 'RiOs' is used in this manual to refer to the RiOs 3 unless otherwise noted. It is highly recommended to completely read this manual and to fully comprehend its contents before attempting normal operation or maintenance of the Water Purification System.

1-2 SAFETY INFORMATION

Your RiOs System should be operated according to the instructions in this manual. In particular, the hydraulic and electrical specifications should be followed and met. It is important to use this equipment as specified in this manual; using this equipment in a different manner may impair the safety precautions of the RiOs System.

Symbol	What it means
	This HAZARD symbol is used to refer to instructions in this manual that need to be done safely and carefully.
	This ATTENTION symbol is used to refer to instructions in this manual that need to be done carefully.
	This UV RADIATION sticker is used to refer to a position on the RiOs System Cabinet or inside of it where exposure to UV light is possible.
	This DANGER sticker is used to refer to a position on the RiOs System Cabinet or inside of it that could be hazardous.
	This ELECTRICAL GROUND sticker is used to refer to a position on the RiOs System Cabinet or inside where an electrical ground connection is made.
	This ELECTRICAL DANGER sticker is used to refer to a position on the RiOs System Cabinet or inside where an electrical danger could exist.

1-3 CONTACTING MILLIPORE

INTERNET

The Millipore Internet Site can be used to find addresses, telephone/fax numbers and other information.

Internet Site Address: www.millipore.com

www.millipore.com/techservice

MANUFACTURING SITE

Millipore SAS

67120 Molsheim

FRANCE

Chapter 2 PRODUCT INFORMATION

2-1 RIOS SYSTEM OVERVIEW

The RiOs System produces purified water from potable tap water by combining Pretreatment and Reverse Osmosis (RO). The RO water is stored in an internal tank for routine rinsing applications, or it can be used to feed an ultrapure water purification system such as a Milli-Q®.

The DISPLAY is used to monitor the water quality and system status.

The KEYPAD is used to access operating functions and system settings.

2-2 RIOS WATER SPECIFICATIONS

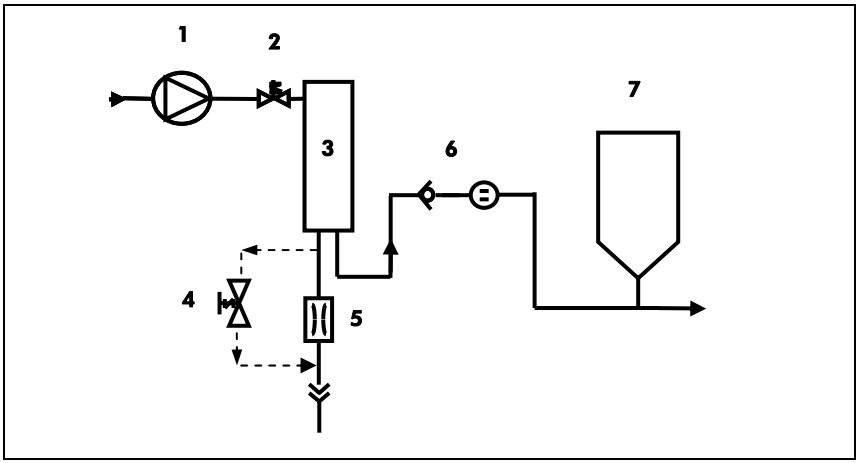
WATER FLOWRATE SPECIFICATIONS

PERMEATE (RO) WATER FLOWRATE	REJECT WATER FLOWRATE (5°C < T < 35°C)
> 2.4 LPH @ 15 °C (typical) > 3.5 LPH @ 25 °C (typical)	30 LPH

RO WATER QUALITY

Ionic Rejection (Typical – Minimum)	> 94 % - 90 %
Rejection of Particles	> 99 %
Rejection of Micro-Organisms	> 99 %
Rejection of Organics	> 99 % for MW > 100 Dalton

2-3 SCHEMATIC OF MAIN COMPONENTS



1	Booster Pump	5	RO Reject Capillary
2	Inlet Solenoid Valve	6	Check Valve and RO Permeate Conductivity Cell
3	SmartPak RO	7	6 Litre Tank
4	RO Reject Solenoid Valve		

2-4 OPERATING PRINCIPLE

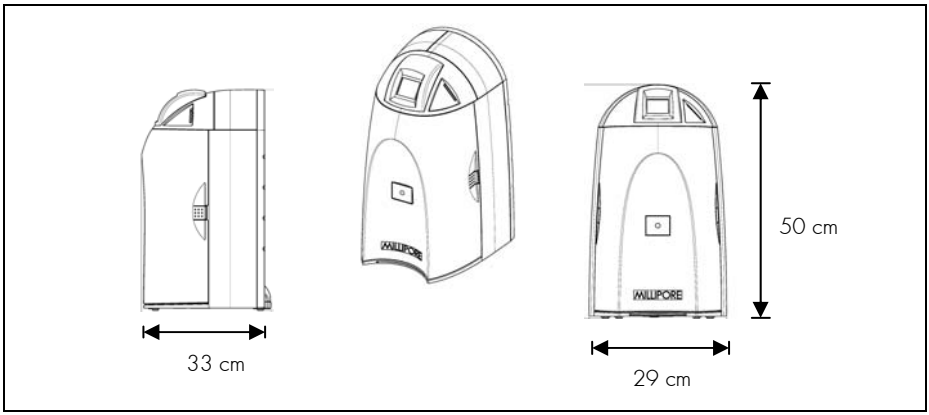
Potable tap water enters the SmartPak RO through the Booster Pump. The SmartPak RO (called 'SmartPak' for the remainder of this manual) combines Pretreatment and Reverse Osmosis (RO) purification technology. The SmartPak is a consumable device that needs to be periodically replaced during the maintenance of the system.

Tap water is pretreated to protect the RO membrane from organic fouling and chlorine oxidation. The RO membrane has 2 exiting streams. The ions, particles, organic molecules and bacteria rejected by the RO membrane are sent to the drain via the Reject tubing. The RO product water is stored in the tank for general rinsing applications, or it can be used to feed an ultrapure water purification system such as a Milli-Q.

2-5 TECHNICAL SPECIFICATIONS

DIMENSIONS

System Height, Width and Depth



Shipping Box

- Height: 56 cm
- Width: 42 cm
- Depth: 64 cm

WEIGHT

SYSTEM	RiOs 3
Operating Weight	15 kg
Dry Weight	7 kg
Shipping Weight	12.3 kg

NOISE LEVEL

A RiOs System has a maximum noise level of 36 dB at a distance of 1 metre away.

ELECTRICAL

- 100 VAC ± 10%, 50/60 Hz. 0.68 amp source, 2 amp T (Time Lag) fuse, Power = 100 VA
- 120 VAC ± 10%, 50/60 Hz. 0.60 amp source, 2 amp T fuse, Power = 100 VA
- 230 VAC ± 10%, 50/60 Hz. 0.37 amp source, 2 amp T fuse, Power = 100 VA

The source of electrical power should be within 2.5 metres of the system. The source of electrical power must be earth grounded.

Chapter 3 PRE INSTALLATION

3-1 INSTALLATION REQUIREMENTS

FEEDWATER REQUIREMENTS

Type of Feedwater	Potable
Flowrate	≥ 30 LPH
Minimum Pressure	≥ 0.5 bar
Maximum Pressure	≤ 6 bar
Conductivity	< 2000 µS/cm
Temperature	5 to 35 °C
pH	4 - 10
Fouling Index	< 10
Iron	< 0.1 ppm as $CaCO_3$
Aluminum	< 0.05 ppm as $CaCO_3$
Manganese	< 0.05 ppm as $CaCO_3$
Free Chlorine	< 1 ppm
Langelier Saturation Index	< + 0.2
TOC	< 2000 ppb

FEEDWATER CONNECTION NEEDED

Feedwater Piping Connection	1/2 inch Male GAZ, NPTM or BSPM

REJECT FLOW REQUIREMENT

Drain Capacity	30 LPH

ENVIRONMENTAL REQUIREMENTS

Indoor Use Only	
Storage Temperature	5 °C < T < 40 °C
Operating Temperature	5 °C < T < 40 °C
Relative Humidity	Should not exceed 80% for temperatures below 31 °C Should stay within 50% to 80% between 31 °C and 40 °C.
Altitude	< 3000 metres
Installation Category	II
Pollution Degree	2

3-2 OPTIONAL EQUIPMENT YOU MAY NEED

WALL MOUNTING BRACKET

The Millipore Catalogue Number for the Wall Mounting Bracket is WMBSMT001. The mounting hardware for attaching the bracket to a wall is not included and must be supplied.

EXTERNAL TANK CONNECTOR

The Millipore Catalogue Number for a Tank Connector Kit is TANKPECKT. An external tank holding up to 30 Litres can be used instead of the internal 6 Litre tank. The mounting hardware for connecting the external tank to the system is not included and must be supplied. The Millipore Catalogue Number for the 30 L PE Reservoir is TANKPE030.

3-3 UNPACKING THE RIOS – WHAT'S INSIDE?

Open the RiOs System Shipping Box. Use the checklist included in the Accessories Bag to make sure all items were shipped and are accounted for. It is highly suggested to become familiar with the items that are shipped since these will be used in the Installation section of this manual.

Contact Millipore if an item is missing.

Chapter 4 INSTALLATION

4-1 PREPARATION OF THE SYSTEM

- ❑ Open the front cover. Locate the tie wrap used to hold the Booster Pump in place during shipping (A).
- ❑ Press on the tab of the tie wrap (B). Remove and pull the tie wrap out.

A

B

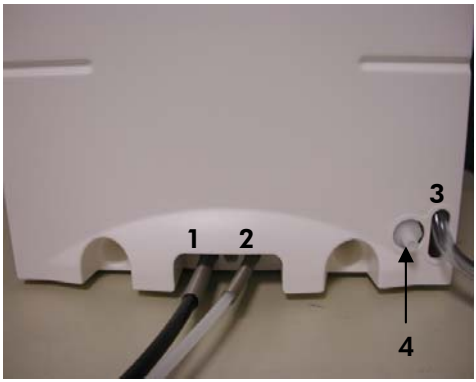
4-2 CONNECTION OF TUBING

Rotate the RiOs so you can see the back of the system (see photo A).

A

1. FEEDWATER TUBING

2. REJECT TUBING



3. OVERFLOW TUBING

4. TANK OUTLET

FEEDWATER TUBING

- ❑ Locate the Feedwater Tubing exiting from the bottom middle of the system (B). A 1/2 inch Female GAZ fitting with a screen filter is attached at the end of this tubing. Unroll it until the fitting reaches the Feedwater source.
- ❑ Apply white tape on the thread of the 1/2 inch Male GAZ valve or fitting of the Feedwater source.
- ❑ Connect the fitting to the valve (C).

B

C

FEEDWATER TUBING

REJECT TUBING

- ❑ Locate the Reject Tubing exiting from the bottom middle of the system (D). Unroll it.
- ❑ Secure the tubing into a sink or drain.

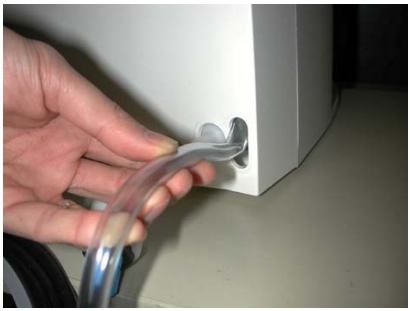
D

REJECT TUBING

OVERFLOW TUBING

- ❑ Locate the Overflow Tubing exiting from the bottom right of the system (E). Unroll it.
- ❑ Secure the tubing into a sink or drain.

E



OVERFLOW TUBING

TANK OUTLET TUBING

- ❑ Locate the Tank Outlet Valve, the Tank Outlet Tubing and the adaptor fitting in the Accessories Bag.
- ❑ Install the Tank Outlet Valve and Tubing as shown (F, G and H).
- ❑ Open the Tank Outlet Valve (I). This allows the tank to be emptied of any water in it. This is necessary when the SmartPak is flushed with water after it is installed.

F

G

H

I

4-3 CONNECTION OF THE POWER CORD – TURNING ON THE SYSTEM POWER

- ❑ Open the front cover of the system (A). This will allow the system to go into STANDBY mode once the system is powered.
- ❑ Plug the Power Cord into the system (B).
- ❑ Plug the other end of the Power Cord into an appropriate source of electrical power (i.e. wall outlet). The system is immediately powered.
- ❑ Open the Feedwater Supply Valve.

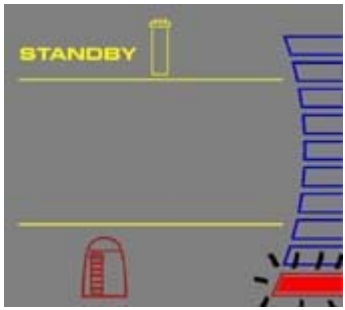
START-UP DISPLAYS

Once the system is powered, the system will start to display information about the software before going into STANDBY mode (C).

A

B

C



4-4 INSTALLATION OF THE SMARTPAK

ATTENTION

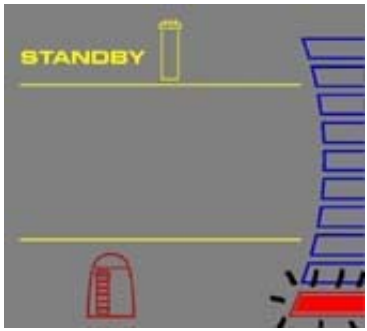
Open the Tank Outlet Valve before installing a new SmartPak. This keeps the tank from filling until the SmartPak is rinsed out (A).

INSTALLATION

- ❑ Make sure the front cover is opened. STANDBY should be viewed on the Display (B).
- ❑ Remove the SmartPak from its shipping box.
- ❑ Remove the protective caps on the ports of the SmartPak and of the system.
- ❑ Locate the O-rings on the ports (C). Wet them with water. It is preferable to wet them with ultrapure water.

A

B



C

- ❑ Install the SmartPak until it is fully seated into the system ports as shown (D, E and F).
- ❑ **CLOSE THE FRONT COVER.**

NOTE: The Tank Outlet Valve should be left open (G).

G

D

E

F

FLUSH MODE

ATTENTION

The Tank Outlet Valve should be left open during FLUSH mode.

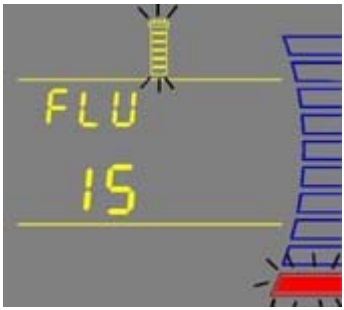
- ❑ The system will now go into FLUSH mode for 15 minutes (H). This is done to empty the SmartPak of air and hydrate the material inside.
- ❑ When FLUSH mode is finished, the system will go into FILLING TANK mode automatically (I).

RINSING THE SMARTPAK

- ❑ Let FILLING TANK mode run for 15 minutes with the Tank Outlet Valve open. This will completely rinse the purification media inside the SmartPak.
- ❑ Close the Tank Outlet Valve (J). The tank will start to fill up with water. It could take approximately 1. 5 to 2 hours to fill the tank. When it is full, the Display will indicate a full tank by illuminating the symbols representing the Tank Level *(see Section 5-1 Understanding the Display)*.

The Vent Filter needs to be installed. See *Section 4-5 Installation of the Vent Filter*.

H



I

J

4-5 INSTALLATION OF THE VENT FILTER

- ❑ Obtain the Vent Filter.
- ❑ Insert the Vent Filter firmly into the fitting (A, B).

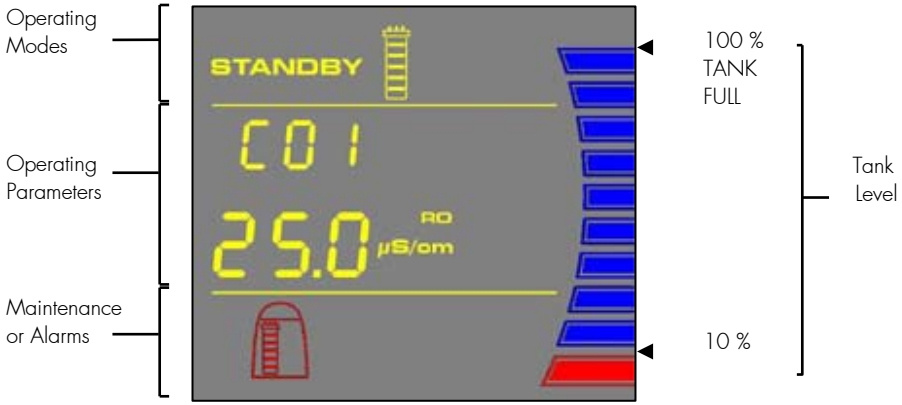
A

B

Chapter 5 USING THE RIOS

5-1 UNDERSTANDING THE DISPLAY

The Display is used to view information about the Operating Modes, the Operating Parameters, Maintenance or Alarm messages and the Tank Level.



5-2 HOW TO GET WATER FROM THE RIOS

FROM THE TANK OUTLET VALVE

RO Water is obtained from the Tank Outlet. Open the Tank Outlet Valve when RO Water is needed (A).

A

TANK OUTLET VALVE

5-3 OPERATING MODES

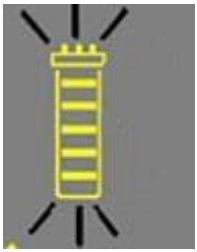
STANDBY

STANDBY mode is displayed when the front cover is removed. The system will depressurize during which STANDBY will be blinking on the Display for 10 seconds. All system operations are disabled. STANDBY mode is selected before attempting maintenance on the system.

FLUSH

FLU (FLUSH) mode is displayed for 15 minutes after a new SmartPak has been installed and the front cover has been closed. FLUSH mode allows tap water to enter and rinse the new SmartPak. The Tank Outlet Valve must be opened during the FLUSH cycle to keep the tank from filling until the SmartPak is rinsed.

FLUSH mode is stopped if the front cover is removed to go into STANDBY mode. When the front cover is closed, FLUSH mode resumes from the last remaining time on the Display.



If the system is powered OFF during FLUSH mode and powered back ON, then a new FLUSH cycle will start.

The system will have a 2 minute FAST FLUSH cycle every 24 hours of TANK FULL mode.

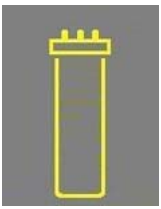
FILLING TANK

FILLING TANK mode is displayed when the tank is being filled with RO Water until the 100% Tank Level display. FILLING TANK mode is launched automatically when the Tank Level display is below the 60% level or after a FLUSH cycle has been completed.

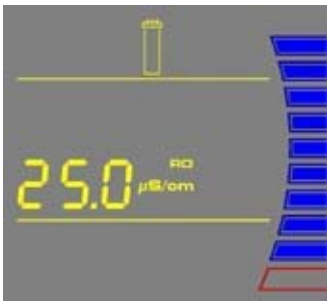
The RO water quality is automatically displayed during FILLING TANK mode.

TANK FULL

TANK FULL mode is shown when the tank was full and has not been emptied below the 60% level. The tank is not being filled with water.



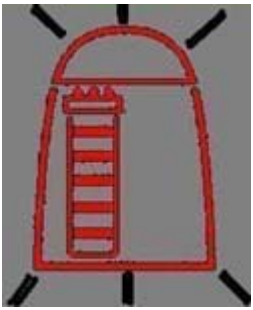
5-4 HOW TO VIEW THE WATER QUALITY IN TANK FULL MODE

Press:	The Display will show the last RO Permeate Water conductivity value measured during FILLING TANK mode. The water quality is displayed for 5 seconds.
	

NOTE: The RO water quality is automatically displayed during FILLING TANK mode.

5-5 HOW TO UNDERSTAND RIOS MESSAGES

PACK ALARM



The system will prompt you to change the SmartPak using a red Pack Alarm icon. The Display will show the red Pack Alarm blinking. The SmartPak is changed due to either the amount of time it has been used or from the amount of water that has passed through it.

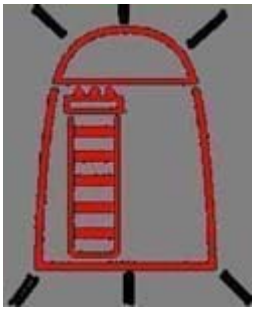
When the red Pack Alarm is displayed as a steady icon, the SmartPak is not installed correctly or not installed at all. If the SmartPak has been reinstalled and the Alarm is still displayed, then contact Millipore.

FLUSH: OPEN TANK OUTLET VALVE

Before FLUSH mode starts, the tank has to be emptied of water. The FLU counter display will be blinking if the system has detected that there is water in the tank. The Tank Outlet Valve must be opened. The system will automatically resume FLUSH mode when the tank is emptied of water.

Chapter 6 MAINTENANCE

6-1 MAINTENANCE SCHEDULE

WHAT TO DO	WHEN?	HOW TO?
SmartPak Replacement	When the Pack Alarm display is blinking.  After a tank sanitization.	See Section 6-2.
Vent Filter Replacement	Replaced when the SmartPak is replaced.	See Section 4-5.
Tank Level Calibration	Periodically.	See Section 6-4.
Screen Filter Cleaning	2 times a year or as necessary.	See Section 6-3.
Sanitization of the Tank	Once a year.	See Section 6-5.

6-2 HOW TO REPLACE THE SMARTPAK

ATTENTION

Open the Tank Outlet Valve before installing a new SmartPak. This keeps the tank from filling until the SmartPak is rinsed out.

REMOVING THE SMARTPAK

- ❑ Open the front cover to go into STANDBY mode. Wait for the system to depressurize. The Display will show STANDBY blinking for 10 seconds.
- ❑ Press your thumbs on the system (A).
- ❑ Swing the pack towards you (B).
- ❑ Remove the pack from the system (C).

A

B

C

INSTALLATION

- ❑ Remove the new SmartPak from its shipping box.
- ❑ Remove the protective caps on the ports of the SmartPak.
- ❑ Locate the O-rings on the ports. Wet them with water. It is preferable to wet them with ultrapure water.
- ❑ Install the SmartPak until it is fully seated into the system ports as shown (D, E and F).
- ❑ **CLOSE THE FRONT COVER.**

NOTE: The Tank Outlet Valve should be left open (G).

G

D

E

F

FLUSH MODE

ATTENTION

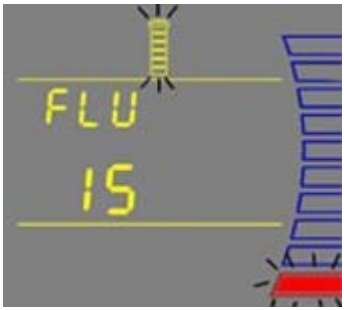
The Tank Outlet Valve should be left open during FLUSH mode.

- ❑ The system will now go into FLUSH mode for 15 minutes (H). This is done to empty the SmartPak of air and hydrate the material inside.
- ❑ When FLUSH mode is finished, the system will go into FILLING TANK mode automatically (I).

RINSING THE SMARTPAK

- ❑ Let FILLING TANK mode run for 15 minutes with the Tank Outlet Valve open. This will completely rinse the purification media inside the SmartPak.
- ❑ Close the Tank Outlet Valve (J). The tank will start to fill up with water. It could take approximately 1. 5 to 2 hours to fill the tank. When it is full, the Display will show the Tank Level filled to the 100% level.

H



I

J

REPLACING THE VENT FILTER

The Vent Filter should be replaced whenever the SmartPak is replaced.

- ❑ Remove the Vent Filter (K).
- ❑ Insert the new Vent Filter into the port. See *Section 4-5 Installation of the Vent Filter*.

The System is now ready for use.

K

6-3 HOW TO CLEAN THE SCREEN FILTER

The purpose of the Screen Filter is to prevent large particles or other debris from entering the system. If the Screen Filter becomes blocked with debris, then the Feedwater will not flow freely to the system.

It is recommended to clean the Screen Filter twice a year or whenever it may have become clogged.

- ❑ Close the Feedwater Supply Valve.
- ❑ Open the front cover to let the system go into STANDBY mode.
- ❑ Locate the Screen Filter. This will be located where the Feedwater 8 mm OD Tubing originates.
- ❑ Unscrew the collar that holds the Feedwater Tubing to the barbed end of the fittings (A). Pull the tubing off of the fitting.
- ❑ Unscrew the Screen Filter from the Feedwater pipe.
- ❑ Go to a sink and flush tap water backwards through the Screen Filter. The water should flow through the barbed end first. Any trapped debris on the Screen Filter will be flushed out (B).
- ❑ Apply 3-4 turns of new white tape to the threads of the Feedwater Pipe in a clockwise direction.
- ❑ Screw the Screen Filter back onto the Feedwater Supply Pipe.
- ❑ Attach the Feedwater Tubing back onto the Barbed Fitting (C).
- ❑ Open the Feedwater Supply Valve.
- ❑ Close the front cover.
- ❑ Leave the system in FILLING TANK or TANK FULL mode.

A

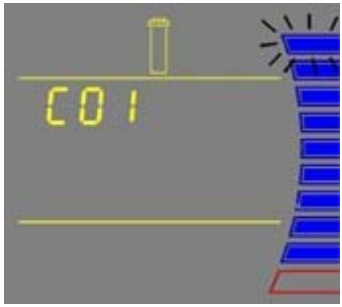
B

C

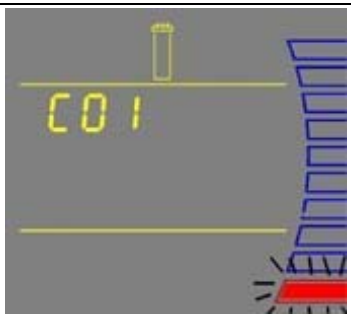
6-4 HOW TO CALIBRATE THE TANK LEVEL (C01)

Before calibrating the tank level, the tank needs to be filled to the 100% level or TANK FULL.

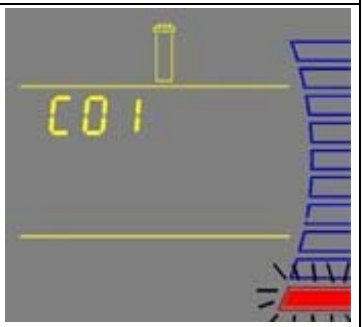
1. Press the Main and "+" Buttons together to enter the menu. The Display will show C01. The highest Tank Level display will be blinking. This means that the highest water level is ready to be calibrated.



2. Press the "+" and "-" Buttons together to enter the highest water level. The Display will show the lowest Tank Level (red level) display blinking.



3. Open the Tank Outlet Valve. Allow the tank to be emptied to its lowest water level.



NOTE: The highest and lowest tank level must be calibrated together or else the tank level is not calibrated.

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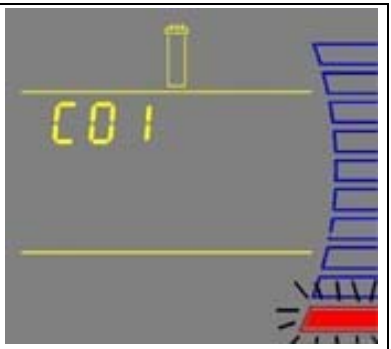
4. Close the Tank Outlet Valve.



5. Press the "+" and "-" Buttons together to enter the lowest water level. The Display will exit the menu option and go into FILLING TANK mode.

The Tank Level is now calibrated.

NOTE: If the Display remains in the menu option and the highest tank level is blinking, then the tank level was not calibrated. The amount of water emptied from the tank was not enough (less than 10%). The tank needs to be emptied to its lowest water level. Allow the tank to fill to the 100% level and perform the calibration again.

6-5 HOW TO SANITIZE THE TANK

A tank sanitization is performed to eliminate bacteria growth in the tank. It is recommended to sanitize the tank at least once a year.

THINGS TO KNOW BEFORE YOU SANITIZE THE TANK

HAZARD

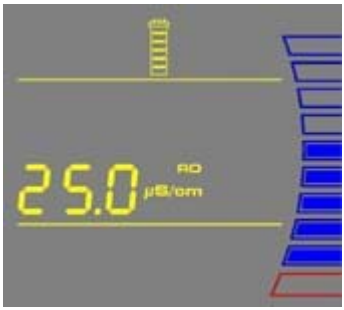
All safety precautions must be followed when handling Hydrogen Peroxide. Rubber gloves, safety goggles and a lab coat must be worn to avoid any skin and body contact.

- ❑ You will need a minimum Tank Level display of at least 50% (A).
- ❑ Locate the clear elbow fitting, the clear tubing and the syringe in the Sanitization Kit (B).
- ❑ You will need 200 ml of 30% of Hydrogen Peroxide solution and 200 ml of purified water. Millipore does not sell Hydrogen Peroxide but it is readily available through most Scientific Supply Companies.
- ❑ The Vent Filter will need to be replaced after the sanitization is completed.
- ❑ The system will not be able to deliver RO water while the system is being sanitized.

ATTENTION

The total time needed to sanitize the tank is at least 4.5 hours.

A



B

SANITIZING THE TANK

- ❑ Open the front cover to go into STANDBY mode (C).
- ❑ Remove the Vent Filter and install the clear elbow fitting from the Sanitization Kit (D).
- ❑ Introduce the male connector of the clear tubing firmly into the elbow fitting (E).
- ❑ Inject 200 ml (1 ml = 1 cc) of Hydrogen Peroxide solution (30%) into the 6 Litre tank via the clear tubing (F).
- ❑ Rinse the air vent port with 200 ml of purified water.
- ❑ Close the front cover (G). The system will now go into FILLING TANK mode. Let the Tank Level display go up to the 100% level (H).

C

D

E

F

G

H

- ❑ Open the front cover to go into STANDBY mode (I).
- ❑ Let the system stand for 1 hour for effective bacteria elimination.
- ❑ (After 1 hour) Check that the Tank Outlet Tubing is secured into the drain. Open the Tank Outlet Valve to drain all the water from the tank (J).
- ❑ Close the Tank Outlet Valve (K).
- ❑ Close the front cover (L). The system will now go into FILLING TANK mode. Let the tank level fill up to the 100% level.

I

J

K

L

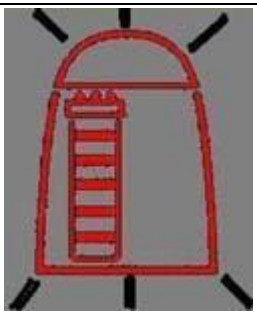
Repeat steps I, J, K and L:

- ❑ Open the front cover to go into STANDBY mode (I).
- ❑ Check that the Tank Outlet Tubing is secured into the drain. Open the Tank Outlet Valve to drain all the water from the tank (J).
- ❑ Close the Tank Outlet Valve (K).
- ❑ Close the front cover (L). The system will now go into FILLING TANK mode.

The tank is now sanitized.

Chapter 7 TROUBLESHOOTING

PROBLEM	POSSIBLE CAUSES	WHAT TO DO
The Display screen is blank.	❑ The power cord is not plugged in. ❑ No source of electrical power. ❑ Main Power Fuse is blown.	➢ Check that the power cord is plugged in. ➢ Check the source of electrical power. ➢ Contact Millipore.
In FILLING TANK mode, the Tank Level display is not rising. *(The Tank Level display should be rising steadily.)*	❑ The Tank Outlet Valve is open. The water in the tank is diverted into the drain. No water is kept in the tank. ❑ The tank level is not calibrated properly. ❑ The RO membrane is dirty or clogged.	➢ Close the Tank Outlet Valve. ➢ Check the Feedwater source. ➢ See *Section 6-4 How to Calibrate the Tank Level (C01).* ➢ Replace the SmartPak.
The last water quality value is not displayed when you press the "+" button in TANK FULL mode.	❑ A measurement was not made during FILLING TANK mode. ❑ The value is out of measurement range.	➢ Allow the system to go into FILLING TANK mode to start a RO permeate conductivity reading again.
	❑ The Tank Outlet Valve is not open. The system detects that there is water in the tank. The system will not resume FLUSH mode until the tank is emptied of water.	➢ Open the Tank Outlet Valve to drain the water from the tank. ➢ Check that the Tank Outlet Valve and Tubing are directed downwards into the drain.

PROBLEM	POSSIBLE CAUSES	WHAT TO DO
	❑ The SmartPak lifetime is exhausted.	➢ Replace the SmartPak. See *Section 6-2 How to Replace the SmartPak.*
	❑ The SmartPak is not installed correctly or not installed at all.	➢ Reinstall the SmartPak. ➢ If the red Pack Alarm is still displayed, then contact Millipore.

Chapter 8 ORDERING INFORMATION

8-1 CATALOGUE NUMBERS FOR RIOS SYSTEMS

For 230 VAC, 120 VAC, 100 VAC:

Z	R	0	S	0	P	0	3	0

8-2 CATALOGUE NUMBERS FOR CONSUMABLES

Consumable Item	Catalogue Number
SmartPak RO	SPR00S001
Millex Vent Filter (1µm), 2/box	TANKMPK03
Sanitization Kit	SANIKIT01

8-3 CATALOGUE NUMBERS FOR ACCESSORIES

Accessory Item	Catalogue Number
Wall Mounting Bracket	WMBSMT001
Tank Connector Kit	TANKPECKT
30 Litre PE Reservoir	TANKPE030